1075-14-234 **Shaowei Lin*** (shaowei@math.berkeley.edu), 970 Evans Hall #3840, Berkeley, CA 94720.
Computing integral asymptotics using toric blow-ups of ideals.

Integrals of the form $Z(N) = \int_\Omega e^{-Nf(\omega)}\varphi(\omega)\,d\omega$ occur frequently in applications such as machine learning and computational biology. We are often interested in the asymptotics $Z(N) \approx CN^{-\lambda}(\log N)^{\theta-1}$ as N grows large. If f has a unique mimimum point where the Hessian is positive definite, the asymptotic coefficients C, λ and θ are given by the classical Laplace approximation. In this talk, we study the case $f = g \circ h$ where $g : \mathbb{R}^k \to \mathbb{R}$ satisfies the above Laplace condition at the origin and $h : \mathbb{R}^d \to \mathbb{R}^k$ is a polynomial map. Using Newton polyhedra and toric resolutions, we introduce a notion of nondegeneracy for ideals and derive formulas for the asymptotic coefficients when the ideal $\langle h_1(\omega), \ldots, h_k(\omega)\rangle$ is nondegenerate. (Received August 30, 2011)